REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

Claims 54 and 56-63 are requested to be canceled without prejudice or disclaimer.

Claims 1, 2, 4-6, 9-12, 14-22, 24, 26, 28, 29, 31-33, 35-45, 47-53 and 64-70 are currently being amended.

This amendment adds, changes and/or deletes claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier.

After amending the claims as set forth above, claims 1, 2, 4-6, 9-12, 14-22, 24-29, 31-33, 35-45, 47-53 and 64-70 are now pending in this application.

Rejections under 35 U.S.C. § 101

Claims 1-2, 4-6, 9, 14-22, 25-29, 31 and 64-65 were rejected under 35 U.S.C. § 101 as allegedly being directed to non-statutory subject matter. Specifically, the Examiner argues that the claimed methods are not tied to another statutory category and do not transform underlying subject matter.

Applicant has amended each of independent claims 9 and 14 to recite a "method of operating an apparatus…." Accordingly, the claims are now tied to an apparatus and are, therefore, directed to statutory subject matter.

Claims 54 and 56-63 were rejected under 35 U.S.C. § 101 as allegedly being directed to non-statutory subject matter. Applicant has canceled claims 54 and 56-63. Accordingly, the rejection of these claims is moot.

Double Patenting

Claims 10, 36-41, 53 and 61 were provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1 and 8 of

copending U.S. Patent Application Serial No. 10/138,178. Applicant will address this provisional rejection upon the indication of allowable subject matter in claims 10 and 14 and will, if necessary, file a terminal disclaimer.

Rejections under 35 U.S.C. § 103

Claims 9-11, 14, 16, 22, 28, 39, 45, 51, 53, 54, 60 and 68-70 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,683,988 to Fukunaga et al. (hereinafter "Fukunaga") in view of U.S. Patent No. 5,926,225 to Fukuhara et al. (hereinafter "Fukuhara"). Further, claims 12, 21, 31, 44, 52, 63 and 66 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Fukunaga in view of Fukuhara and further in view of U.S. Patent Publication No. 2002/0009141 to Yamaguchi et al. (hereinafter "Yamaguchi"). Applicant respectfully traverses these rejections for at least the following reasons.

Embodiments of the present invention provides for the encoding and decoding of video signals representing a sequence of pictures. In one embodiment, the encoding of a video signal includes obtaining a prediction for a current picture of the sequence or a part of the current picture from a local default reference picture. An indicator is generated for the current picture or a part of the current picture. The indicator identifies an alternative reference picture for prediction of the current picture or a part of the current picture when a remote default reference picture corresponding to the local default reference picture cannot be reconstructed in a subsequent remote decoding process. The indicator is transmitted for use in the subsequent remote decoding process when decoding the current picture or a part of the current picture.

In this regard, an encoder according to an embodiment of the present invention can operate independently of the decoder. Further, there is no need for the encoder to alter the way in which the pictures to be transmitted are to be encoded in the event of an error at the decoder. Rather, the indicator transmitted from the encoder to the decoder provides sufficient information for the decoder to independently select an alternative reference picture for use in decoding the current picture.

The cited references fail to teach or suggest the features of the pending claims.

<u>A. Fukunaga</u>

Fukunaga relates to a picture transmission system that transmits a series of pictures from an encoding apparatus to a decoding apparatus, each picture being encoded and subsequently decoded with reference to a preceding (reference) picture. When a transmission error occurs, the decoding apparatus detects a decoding error caused by the transmission error and sends an error signal to the encoding apparatus. The encoding apparatus and decoding apparatus then <u>both</u> <u>modify</u> part of a reference picture affected by the decoding error, making identical modifications. A subsequent picture is then encoded and decoded with reference to the modified reference picture, thereby enabling recovery from the transmission error (see abstract).

As described at Fukunaga, col. 4, lines 12-18, an encoding apparatus 100 according to a first embodiment comprises a moving-picture input unit 101, an encoding unit 102, a coded-data transmission unit 103, a decoding unit 104, a reference-picture memory 105, an error-signal receiving unit 106, a reference-picture modification unit 107, a reference-relationship memory 108, and an end-information generator 109. See Fukunaga, col. 4, lines 12-18. A corresponding decoding apparatus 200 comprises a coded-data receiving unit 201, a decoding unit 202, a moving-picture output unit 203, a reference-picture memory 204, an error-signal transmission unit 205, a reference-picture modification unit 206, a reference-relationship memory 207, and an end-information receiving unit 208. See Fukunaga, col. 5, lines 42-48.

Figure 6 of Fukunaga illustrates the operation of the encoding apparatus 100 and the decoding apparatus 200 according to Fukunaga as outlined in the abstract mentioned above. It presents an example in which the encoding apparatus 100 encodes six frames, numbered 1 to 6, using inter-frame coding. See Fukunaga, col. 6, line 58 – col. 7, line 57.

A transmission error occurs in frame 2, as indicated by the dotted arrow from frame 2 in the encoding apparatus to frame 2 as received at the decoding apparatus. As a result of the error, the decoding apparatus 200 is unable to decode (reconstruct) four consecutive blocks in frame 2. The four blocks in question are shaded diagonally in frame 2 at the bottom of Figure 6 of Fukunaga and are labeled 1. Despite having been decoded incorrectly, these four blocks

are supplied to the moving-picture output unit 203, where they are displayed as is, or standard error-concealment measures may be taken, for example.

In the reference-picture memory 204 of the decoding apparatus 200, the reference-picture modification unit 206 replaces the four erroneous blocks with the corresponding blocks of data copied from the preceding frame (frame 1), and the error-signal transmission unit 205 transmits a decoding error signal to the encoding apparatus 100, as indicated by the dash-dot arrow. In the meantime, the encoding apparatus 100 encodes and transmits the next frame (frame 3) with reference to an unmodified reference frame (frame 2).

No transmission error occurs in frame 3 and thus frame 3 is received in full by the decoding apparatus 200. However, because of error propagation from frame 2, decoding apparatus 200 is unable to correctly decode eight blocks of frame 3, including the four diagonally shaded blocks (labeled 1) that were erroneous in frame 2 and four horizontally shaded neighboring blocks (labeled 2) that rely on prediction using region 1.

The incorrectly decoded data are furnished to the moving-picture output unit 203. In the reference-picture memory 204, the reference-picture modification unit 206 replaces all eight of these blocks by copying the corresponding data from modified frame 2. The four horizontally shaded blocks in Figure 6 (those associated with the label 2) receive data that originated in frame 2, while the four diagonally shaded blocks (labeled 1) receive data that originated in frame 1. In frame 3, all of the blocks that were decoded incorrectly in frame 2 and all of the blocks that are affected by the incorrect decoding of blocks in frame 2 (due to error propagation) are thereby replaced with data not affected by the transmission error. This is achieved by copying blocks from modified frame 2.

By now, the encoding apparatus 100 has received the decoding error signal (dot-dashed arrow of Figure 6) transmitted from the decoding apparatus 200 for frame 2. Before encoding the next frame (frame 4), the reference-picture modification unit 107 selects frame 3 as the reference frame to be modified, and <u>makes the same</u> data replacements in the reference-picture memory 105 in the <u>encoding apparatus 100</u> that the reference-picture modification unit 206 made in the reference-picture memory 204 in the decoding apparatus 200 i.e. a “re-encoding process” is initiated.

As indicated by the arrows, the reference-picture modification unit 107 replaces four erroneous blocks in frame 2 by copying data from frame 1, creating a modified frame 2', then replaces eight blocks in frame 3 with data copied from the modified frame 2', creating a modified reference frame 3' identical to the reference frame 3 stored in the decoding apparatus 200. As a result, frame 4 is encoded with reference to the modified reference frame 3'.

When the encoding apparatus 100 transmits the data for frame 4 to the decoding apparatus 200, the coded-data transmission unit 103 adds end-of-modification information, generated by end-information generator 109, indicating that the error in frame 2 has been dealt with by making all necessary modifications of the reference frame used in encoding frame 4.

Since frame 4 was accompanied by an end-of-modification signal, when the decoding apparatus 200 decodes frame 4, the decoded data are stored in the reference-picture memory 204 without further replacements. Frame 4 is thus decoded correctly, because both the encoding unit 102 and decoding unit 202 refer to identical frame-3 reference data. No further data replacements are made, and subsequent frames are decoded correctly, to the extent that no further transmission errors occur.

1. <u>Fukunaga fails to teach or suggest an alternative reference frame which is singled from the encoder to the decoder</u>

Fukunaga fails to teach or suggest an alternative reference frame which is specifically signaled from the encoder to the decoder. In accordance with the disclosure of Fukunaga, the only signal that is transmitted from the encoder to the decoder is the "end-of-modification signal", which tells the decoder to stop modifying the reference frames. Significantly, the end-of-modification signal does not instruct the decoder to use a different reference frame than it would otherwise use. As illustrated in Figure 6 of Fukunaga, decoding of frame 4 is always conducted using modified frame 3, whether or not the end-of-modification signal is received.

In the event that the decoder does not receive an end-of-modification signal before starting to decode frame 4, it will decode frame 4 with reference to modified frame 3,

copying any blocks affected by the error in frame 2 from modified frame 3. In the event that the decoder receives an end-of-modification signal in connection with frame 4, the decoder will still decode frame 4 with respect to modified frame 3. However, in this case it will use regular motion compensated prediction with respect to modified frame 3, since it knows (as a result of receiving the end-of-modification signal) that the encoder has now made equivalent modifications to frame 3 and has predicted frame 4 with respect to modified frame 3. Thus, the end-of-modification signal in Fukunaga cannot be equated with the indicator recited in the pending claims.

Furthermore, with respect to the "re-encoding" process conducted at an encoder implemented according to Fukunaga's teaching, this process does not involve "generating an indicator for use in error concealment of the current picture or respectively for said part of a current picture, the indicator configured to identify an alternative reference picture, which is sufficiently similar to the local default reference picture so that it can be used in a corresponding decoding process, instead of a corresponding default reference picture, in forming a motion compensated prediction for the current picture or respectively for said part of a current picture when the corresponding default reference picture cannot be reconstructed in the corresponding decoding process " as recited in the pending claims. This is because, in accordance with the disclosure of Fukunaga (in the encoder and in the corresponding decoder), there is <u>no alternative</u> reference picture for use in the prediction of another. Specifically, in accordance with the disclosure of Fukunaga, every predicted picture is predicted from its <u>immediate predecessor</u>. Although the re-encoding process at the encoder conceals errors by copying image blocks from one picture to another, an alternative reference picture is not provided and is not signaled in any way. Any given picture is always predicted from its immediate predecessor, irrespective of whether the preceding picture is a one that has been modified in order to take errors at the corresponding decoder into account. Thus, Fukunaga always uses <u>the same reference for prediction, and does not use an alternative, sufficiently similar, reference picture.</u>

The indicator generated by the presently claimed encoder is configured to indicate an alternative reference picture at the decoder. This enables the decoder to use an alternative reference picture for prediction of the current picture in the event that errors affect the default

reference picture that would otherwise be used to predict the current picture at the decoder. Not only is this different from Fukunaga, where the decoder has no indication of an alternative reference picture for use in prediction, but also the embodiments of the present invention provide a significant advantage compared with Fukunaga. More specifically, in Fukunaga's system, the decoder must continue decoding pictures of encoded video data with respect to corrupted reference pictures until it receives the end-of-modification signal from the encoder which signifies that the currently encoded picture has been re-encoded taking into account the original error that occurred.

By providing a specific indication of an alternative reference picture to the decoder, embodiments of the present invention enables the decoder to react more quickly, without having to provide a feedback signal to the encoder, when an error occurs, such that the erroneous reference picture is not used for prediction, but is replaced by the signaled alternative reference picture. This contrasts with a decoder that implements Fukunaga's method. In particular, Fukunaga's decoder must continue to decode successive pictures with respect to erroneous reference pictures, in which the original error progressively propagates and spreads. In Fukunaga, this progressive error propagation, and commensurate degradation of the reconstructed video signal, is only arrested at the point when the decoder receives the end-of-modification signal from the encoder. This signifies that the original error has been taken into account in the latest picture to be encoded, which should therefore be capable of reproduction at the decoder without error.

By providing an indication that is explicitly signaled, embodiments of the present invention enables a corresponding decoder to use an alternative reference picture that is similar to the local default reference picture, thereby allowing the embodiments of the present invention to effectively reduce error propagation. Fukunaga does not provide an explicit signaled indication of an alternative reference picture. A picture decoded using the signaled alternative reference picture, will be erroneous to some extent, since the picture to be decoded was not encoded with respect to the alternative reference picture but with respect to the default reference picture. However, because the alternative reference picture was chosen for its similarity to the local (encoder) default reference picture, it is also likely to be similar to the corresponding default reference picture at the decoder. Thus, using the alternative

reference picture for prediction at the decoder is likely to produce a decoded picture that corresponds rather accurately with the decoded picture that would have been produced if the original (corresponding default) reference picture had been used as prediction reference. To re-emphasise, this is not the case in Fukunaga's system, where pictures reproduced at the decoder are likely to exhibit significant degradation until error propagation is arrested by arrival of the end-of-modification signal and the corresponding encoded picture that takes into account the effects of the original error and its propagation.

Further, even if the Examiner considers the modified reference pictures used in Fukunaga's encoder as "alternative" reference pictures (e.g. because they are different in image content from the reference pictures that would ordinarily be used in situations where no errors occur), there is no explicit signaling of such an alternative between the encoder and the corresponding decoder, as recited in the pending claims: "*providing the indicator for use in the corresponding decoding process*". Indeed, in Fukunaga's system, there would be absolutely no need for such explicit signaling, since the encoder "recreates" the sequence of errored pictures present at the decoder during the re-encoding of pictures that takes place responsive to an error being signaled by the decoder.

2. <u>Fukunaga cannot be applied to pre-encoded video sequences such as those used in streaming applications</u>

Furthermore, because Fukunaga's system requires some degree of synchronicity between the encoder and decoder, it must operate in real time. Specifically, Fukunaga's error concealment method requires feedback from the decoder to control the encoding process. Thus, Fukunaga's system cannot be applied to pre-encoded video sequences, such as those used in streaming applications, since there is no possibility to send feedback and affect the way in which the video stream is encoded. In such a system, it is therefore advantageous for error concealment methods to work without the need for feedback to the encoder.

In contrast, because the encoder of embodiments of the present invention provides the indicator to the decoder (e.g. as part of the encoded bit-stream), it enables the decoder to operate independently to conceal transmission errors. Accordingly, embodiments of the

present invention can be used in streaming applications and, for example, multi-cast applications in addition to real time applications.

Typical video streaming applications transmit pre-encoded video streams e.g. over the Internet to a receiving terminal, where the video is decoded and played-back during continued transmission of the stream. As the transmitted stream is pre-encoded, there is no possibility for the streaming server in the network to respond to feedback from a decoder when an error occurs. Indeed, the streaming server probably does not even include a video encoder. Clearly, the error concealment mechanism proposed by Fukunaga cannot be implemented in such a system. In a multi-cast application, for example a video conference with multiple participants, video may be encoded and transmitted in real-time and the encoder at the transmitting site may also be able to receive and respond to feedback requests should errors occur in the transmitted encoded signal. Thus, in principle, this would allow implementation of an error concealment mechanism as proposed by Fukunaga. However, Fukunaga's error concealment technique would also be impractical for such an application. Because multi-casting systems deliver encoded video substantially simultaneously to multiple recipients via different communication paths, multiple different errors may occur either simultaneously or in close succession. Thus, employing Fukunaga's error concealment mechanism in this scenario could very easily lead to a situation in which the transmitting encoder would receive multiple and potentially conflicting re-encoding requests from different recipients. This would rapidly lead to overload and breakdown of the encoding system. Such problems do not arise in a system implemented according to embodiments of the present invention since each receiving decoder is able to perform error concealment independently, based on the received indication of an alternative reference picture, without the need for any interaction with the encoder.

3. Fukunaga fails to disclose a system in which the encoder and the decoder can operate independently

A video encoder implemented according to Fukunaga's patent receives an error signal from a corresponding video decoder, indicating that a particular picture of the video signal was incorrectly received and therefore contains decoding errors. In response to this feedback, Fukunaga's encoder re-encodes all subsequent pictures, starting from the signaled (erroneous)

picture up to the current picture to be encoded, taking into account the errors that occurred in the identified erroneous picture. Accordingly, the encoding performed in Fukunaga, unlike embodiments of the present invention, is dependent on (and therefore not independent of) error detection in a corresponding decoding process and relies on feedback signaling.

In Fukunaga, the "re-encoding" process is necessary since there is inevitably a delay between generation of the error signal at the corresponding decoder and its receipt as a feedback signal at the encoder. During the period between transmission of the error feedback signal from the decoder and its receipt at the encoder, a certain number of pictures will have been encoded normally (without knowledge of the error) and thus need to be re-encoded once the error signal is received at the encoder. This effectively compensates for the effects of the error.

In more detail, in Fukunaga's re-encoding procedure (which is initiated based on feedback from the corresponding decoding process) each picture in turn, starting from the picture in which the error occurred, is re-encoded (predicted) using <u>its immediate predecessor as a reference picture</u>, taking into account the errors which occurred in the identified picture and the way in which the errors progressively propagate through the sequentially predicted pictures. Once the encoder has sequentially re-encoded each of the pictures between the picture signaled as containing the error and the current picture, according to Fukunaga, the effects of the error will have been effectively accounted for in the encoding of the current picture. This effective "correction" of the current picture comes about because it is predicted with respect to a modified reference picture (<u>its immediate predecessor</u>) in which the effect of error propagation has been taken into account. The encoded data for the current picture can thus be transmitted to the corresponding decoder together with an indication (end-of-modification signal) that the re-encoding process in view of the signaled error is now complete.

At the decoder, the received encoded data for the current picture is reconstructed (decoded) by prediction with respect to a reference picture (the immediately preceding picture) that has been affected by error propagation in exactly the same way as the reference (immediately preceding) picture used to predict the current picture at the encoder. The net

result is that the current picture is reconstructed at the decoder without error (assuming further errors have not occurred during its transmission to the decoder). Therefore, the Examiner will appreciate that Fukunaga requires feedback signaling for operation. This is in stark contrast to embodiments of the present invention in which the encoder and decoder can operate independently of one another.

B. Fukuhara fails to cure the above-noted deficiencies of Fukunaga

Nevertheless, the Examiner also appears to consider the teachings of Fukuhara to be relevant in combination with Fukunaga. Firstly, the Examiner will appreciate that Fukuhara does not relate to error concealment. Therefore, a skilled person will not consider the teachings of Fukuhara when looking to improve on error concealment, as per embodiments of the present invention. Secondly, a skilled person would actually not receive any relevant teaching from Fukuhara given that it does not relate to error concealment. Furthermore, it is beyond the ability of the skilled person to adapt any teaching from Fukuhara, which does not relate to error concealment, and combine it with Fukugana to arrive at embodiments of the present invention. Further, the combination would actually not provide the present invention. These aspects are discussed below.

Specifically, Fukuhara concerns an image (video) encoder, which includes both a short-term frame memory (STFM) and a long-term frame memory (LTFM), located in the local decoding loop of the video encoder (see Figure 1, for example). In operation, the STFM and LTFM are used in the construction of prediction reference pictures for use in motion compensated video encoding. More specifically, when a first picture of a video sequence is encoded, it is also decoded and stored in the STFM for use as a reference picture in the motion compensated prediction of a following picture of the sequence (column 8, lines16 to 30). Encoding and associated local decoding of subsequent pictures of the sequence continues and, after a particular delay, controlled by delay time controlling unit 12, the encoded and subsequently decoded version of the first picture is stored in the LTFM (column 8, lines 30 to 47 and Figure 1). By this time, a new reference picture, corresponding to a later picture of the video sequence will be available in the STFM. Thus, the two frame memories STFM and LTFM contain different decoded pictures that can be used as reference pictures,

corresponding to two different past pictures of the video sequence, separated in time by a predetermined amount.

Referring to Figure 1 of the Fukuhara patent, it can be seen that the video encoder also comprises two motion compensated prediction units, block-based predicting unit 14 and segment-based predicting unit 15. In the Fukuhara patent, operation of block-based predicting unit 14 is described in connection with the block diagram of Figure 3. In operation, block-based predicting unit 14 forms 3 predictions for a current picture to be encoded. One of the predictions is formed using the decoded picture stored in the STFM as a reference picture for motion compensated prediction. The second prediction is formed using the decoded picture stored in the LTFM as a reference picture, while the third is formed by interpolating between the first and second predictions (column 8, line 53 to column 9, line 29). The prediction error between each of the 3 predictions and the image being coded is determined and the <u>prediction providing the smallest error is selected</u> by error comparing unit 27 (column 9, lines 32 to 40). The corresponding prediction information (the prediction error Eg, the predicted image Ge and associated motion vector Uv) then form the output of the block-based predicting unit 14 (column 9, lines 41 to 59 and Figure 3). Thus, in the block-based coding mode it should be noted that at the end of the encoding process, the encoded picture is based on only <u>one</u> reference picture (one of the reference picture stored in the SFTM, the LFTM or an interpolation between the two) and the decoder is not notified of any alternative reference picture.

The segment-based predicting unit 15 operates in a similar manner, but based on segmented pictures, rather than complete pictures, as in the case of block-based predicting unit 14. In the Fukuhara patent, 4 image segmentation schemes are used (horizontal, vertical, left-slanting diagonal and right-slanting diagonal - see Figure 8 and column 10, lines 4 to 16 of the patent), each of which effectively divides an image to be encoded into two parts (halves). Separate predictions are then performed each of the two image halves, using each of the two possible reference pictures (the one stored in the STFM and that stored in the LFTM). This gives rise to a total of 4 possible predictions for each segmented picture (column 10, lines 17 to 48 and Figure 9). The prediction error between each of the 4 predictions and the image being coded is determined and error comparing unit 49 (Figure 5)

selects the prediction providing the smallest prediction error (column 11, lines 10 to 21). The segment-based predicting unit then outputs information concerning the selected segment pattern (prediction parameter Ep), the predicted image Ge, the prediction error Eg and the associated motion vector Uv (column 11, lines 29 to 49 and Figure 4). Thus, in the segment-based coding mode it should be noted that at the end of the encoding process, each half the encoded picture is based on only one reference picture (one of the reference picture stored in the SFTM or the LFTM) and the decoder is not notified of any alternative reference picture.

The outputs from both the block-based predicting unit 14 and the segment-based predicting unit 15 are further provided to selecting unit 16 which selects either the prediction formed by the block-based predicting unit 14 or the segment-based predicting unit 15 based on which of the two units provides the prediction with the smaller prediction error (column 11, line 50 to column 61). The selecting unit provides an indication Em of the chosen prediction mode (block-based or segment-based). This indication, together with the other parameters relating to the selected encoding mode, are variable length coded and added to the coded bit-stream CBS produced by the video encoder (column 12, lines 10 to 21). In view of the preceding detailed description of the block-based and segment-based encoding modes proposed by Fukuhara provided above, it should be appreciated that this indication is purely an indication of a selected encoding mode and is not an indication of an alternative reference picture . In both cases, only the reference picture which is actually used for prediction of a given image (in block-based encoding mode) or image-half (in segment-based encoding mode) is indicated. There is no consideration of transmitting any alternative reference picture, for example, for use in error concealment when the indicated reference cannot be reconstructed because it is lost during transmission or too badly corrupted.

Description of a video decoder implemented according to Fukuhara's teachings can be found in the patent between column 16, line 61 and column 18, line 55, under the heading "9th Embodiment". Like the encoder, Fukuhara's video decoder comprises a short-term frame memory STFM and a long-term frame memory LTFM. In operation, the decoder receives a coded bit-stream CBS generated by a corresponding video encoder (e.g. implemented according to any one of the embodiments 1 - 8 described in the Fukuhara patent) and starts to decode information related to the encoded video pictures, by recovering and decoding

encoded parameters representative of the encoded picture contained in the coded bit-stream CBS (column 17, lines 52 to 65). Once a particular picture has been decoded it is stored immediately in the STFM and then, after a predetermined delay, it is also stored in the LTFM, in a manner identical to that detailed in the description of the corresponding encoder provided above (column 17, line 66 to column 18, line 4).

In decoding the received encoded images, the decoder operates responsive to the prediction mode indicator Em decoded from the CBS. Specifically, mode change unit 111 analyses the prediction mode indicator Em and chooses either block-based or segment-based prediction according to the indication provided (column 18, lines 5 to 37). As can be seen from Figure 20, in prediction mode indicator Em provides an explicit indication of the reference picture to be used in the block-based prediction mode. More specifically, each of the 3 possible prediction reference pictures is assigned a separate variable length code, the presence of a particular one of these codes in encoded bit-stream indicating that the corresponding one of the 3 possible reference pictures is to be used for motion compensated prediction of the picture currently being decoded. For segment-base prediction only a single variable length code is assigned in Em, but it should be remembered that in segment-based prediction mode, parameter Ep provides an indication of the particular prediction pattern to be used Ep includes explicit indication of the reference picture to be used in reconstruction of the respective image halves (column 11, lines 34 to 42 and Figure 10). Thus, in both the block-based and segment-based encoding modes, the decoder receives a specific indication of a prediction reference picture to be used in prediction of a particular picture or picture segment. There is no indication of any alternative reference picture which may be used for prediction if the default reference picture becomes corrupted.

In view of the above, Fukuhara does not provide an alternative reference picture to the decoder. It actually selects one of the possible reference pictures in the encoder and provides an indication of that reference picture for use in decoding. The decoder then uses that reference picture when decoding. Fukuhara is silent on what happens if that reference picture is lost/corrupted. In fact, Fukuhara is silent on error concealment altogether and unlike embodiments of the present invention, does not have any relevant teaching that can be applied to error concealment. Therefore, the disclosure of Fukuhara is not relevant to the

pending claims. Further, it is only with the benefit of improper hindsight that one of ordinary skill would combine the teachings of Fukunaga with Fukuhara to allegedly arrive at the present invention, particularly as Fukuhara does not relate to error concealment at all.

C. Yamaguchi also fails to cure the above-noted deficiencies of Fukunaga and Fukuhara

Yamaguchi is cited as allegedly disclosing "a video encoding and decoding apparatus" and teaching "the conventional radio communication means for transmission and reception of compressed video data … as well as the scalable video coding and decoding, and enhancement layer video coding and decoding …." Office Action dated January 12, 2009, page 15. The Examiner does not cite Yamaguchi as disclosing the above-noted features of the pending claims. Further, a thorough review of Yamaguchi by Applicant fails to yield any such disclosure.

Thus, since the cited references, either alone or in combination, fail to teach or suggest at least the above-noted features of the pending claims, the claims are not obvious.

Accordingly, independent claims 9, 10, 11, 12, 14, 53, 66 and 68-70 are patentable. As to canceled claims 54, 60 and 63, the rejection is moot. As to claims 16, 21, 22, 28, 31, 39, 44, 45, 51 and 52, these claims each depend from one of allowable claims 9, 10, 11 or 14 and are, therefore, patentable for at least that reason, as well as for additional patentable features when those claims are considered as a whole.

Claims 1, 2, 4-6, 15, 17-20, 24-27, 29, 32-33, 35-38, 40-43, 47-50, 56-59, 61-62, 64, 65 and 67 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Fukunaga in view of Fukuhara and further in view of various references. As to canceled claims 56-59, 61 and 62, the rejection is moot. As to claims 1, 2, 4-6, 15, 17-20, 24-27, 29, 32-33, 35-38, 40-43, 47-50, 64, 65 and 67, these claims each depend from one of allowable claims 9, 10, 11 or 14 and are, therefore, patentable for at least that reason, as well as for additional patentable features when those claims are considered as a whole.

Conclusion

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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